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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,217	01/14/2004	Robbert van Vossen	57.0554 US NP	3795

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Intellectual Property Law Department
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EXAMINER	
HUGHES, SCOTT A	
ART UNIT	**PAPER NUMBER**
3663	

DATE MAILED: 12/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/757,217	VOSSEN ET AL.	
	Examiner	Art Unit	
	Scott A. Hughes	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11, 13-16* is/are rejected.

7)☒ Claim(s) *12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1-16 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3-11, 13-14, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trampert in view of Zhu.

With regard to claim 1, Trampert discloses a method for retrieving local near-surface material information (Summary). Trampert discloses providing a group of receivers comprising at least one buried receiver and at least one surface receiver (Summary, page 296, 2nd Column; Figs. 1-2). Trampert discloses recording a seismic wavefield, estimating a propagator from the recorded seismic wavefield, inverting the propagator and retrieving the near-surface material information (Pages 293-295). Trampert discloses the use of a P-SH propagator, but not the use of a P-SV propagator. Trampert states that the SH and coupled P-SV waves are present, but only finds the propagator matrix for P-SH waves. Zhu teaches the solution to both the P-SH and P-SV propagation matrices (Pages 2-3). Zhu discloses the 2 by 2 P-SH matrix that

Trampert uses, but also teaches the solution to a P-SV matrix that is formed from the same seismic data. It would have been obvious to modify Trampert to use the P-SV propagator solution disclosed by Zhu in order to gain information about a multi-layered space from seismic waves generated by a source in both static and dynamic cases.

With regard to claim 3, Trampert discloses that the receivers are geophones (Fig. 1; Page 299, 1st column).

With regard to claim 4, Trampert discloses that the buried receiver is a three-component geophone (Fig. 1).

With regard to claim 5, Trampert discloses that the buried receiver is located at a depth of less than 10 meters.

With regard to claim 6, Trampert discloses that the buried receiver is located in a borehole (Summary; Fig. 1).

With regard to claim 7, Trampert discloses that the seismic wavefield comprises P and S waves (Page 293, 2nd column).

With regard to claim 8, Trampert discloses that the propagator is calculated for the recorded seismic wavefield (Page 293-295).

With regard to claim 9, Trampert does not disclose that the propagator used is a coupled P-SV propagator. Zhu discloses using a coupled P-SV propagator (pages 2-3). It would have been obvious to modify Trampert to use the P-SV propagator solution disclosed by Zhu in order to gain information about a multi-layered space from seismic waves generated by a source in both static and dynamic cases.

With regard to claim 10, Trampert discloses assuming that the recorded seismic wavefield can be written as a superposition of plane waves (Page 293, 1st column, under "Propagator Inversion").

With regard to claim 11, Zhu discloses defining propagator coefficients, which are wavefield decomposition filters, for free surface plane waves and extrapolating coefficients to a depth delta Z (Page 2).

With regard to claim 13, Zhu discloses that the inversion of the P-SV wave propagator for material properties is carried out in the frequency domain (Page 1).

With regard to claim 14, Trampert discloses that the inversion for material properties is carried out for the surface wave component of the seismic signal (Page 294, 2nd column).

With regard to claim 16, Trampert discloses a method for retrieving local near-surface material information (Summary, page 293). Trampert discloses obtaining seismic wavefield information from a group of receivers comprising at least one buried receiver and at least one surface receiver (Summary, page 296, 2nd Column; Figs. 1-2). Trampert discloses estimating a propagator from the recorded seismic wavefield. Trampert discloses inverting the propagator and retrieving the near-surface material information (Pages 293-295).

Claims 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Trampert in view of Zhu as applied to claim 1 above and further in view of Frasier or Bakulin.

With regard to claim 2, Trampert discloses that the group of receivers comprises one surface receiver and not a plurality of them. It is known in the art to use more than one receiver at spaced apart locations on the surface in order to obtain data about a larger area (see Frasier, Bakulin). It would have been obvious to modify Trampert to include multiple receivers as taught by Frasier and Bakulin in order to sense the seismic signals over a survey area to gain data about the underground formation under that area.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Trampert in view of Zhu as applied to claim1 above and further in view of Xu.

With regard to claim 15, Trampert does not disclose that the propagator used is for an anisotropic or a transversely isotropic medium. Trampert discloses propagators for use in homogeneous layer. Xu discloses that most layers of the earth are homogeneous, generally anisotropic layers (Page 454, 1st column). Therefore, the propagator of Trampert is for anisotropic media.

Claims 1, 3-8, 10, 13-14, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Trampert in view of Silawongsawat.

With regard to claim 1, Trampert discloses a method for retrieving local near-surface material information (Summary). Trampert discloses providing a group of receivers comprising at least one buried receiver and at least one surface receiver (Summary, page 296, 2nd Column; Figs. 1-2). Trampert discloses recording a seismic

wavefield, estimating a propagator from the recorded seismic wavefield, inverting the propagator and retrieving the near-surface material information (Pages 293-295). Trampert discloses the use of a P-SH propagator, but not the use of a P-SV propagator. Trampert states that the SH and coupled P-SV waves are present, but only finds the propagator matrix for P-SH waves. Silawongsawat teaches the solution to both the P-SH and P-SV propagation matrices (Pages 5-20, especially pages 8-12). Silawongsawat teaches that matrices can be made from the three-dimensional seismic problem that includes P, SH, and SV components for body and surface waves. Silawongsawat teaches that for plane waves, the P-SV matrix propagator can be found for seismic data and that this propagator can be inverted to allow a complete specification of a seismic wavefield (Page 11). It would have been obvious to modify Trampert, which discloses the receivers capable of receiving and processing seismic waves, including P-SV waves, to include using a P-SV propagator as taught by Silawongsawat in order to determine the seismic wavefield of all of the layers of the layers through which the seismic waves pass. This would include the near-surface layer properties, which Trampert discloses are found by inverting the propagator matrix for P-SH waves, but not P-SV waves. Since Silawongsawat teaches that the P-SV propagator also gives properties of the layers, it would be obvious that the near-surface layer properties could be determined from the P-SV propagator.

With regard to claim 3, Trampert discloses that the receivers are geophones (Fig. 1; Page 299, 1st column).

With regard to claim 4, Trampert discloses that the buried receiver is a three-component geophone (Fig. 1).

With regard to claim 5, Trampert discloses that the buried receiver is located at a depth of less than 10 meters.

With regard to claim 6, Trampert discloses that the buried receiver is located in a borehole (Summary; Fig. 1).

With regard to claim 7, Trampert discloses that the seismic wavefield comprises P and S waves (Page 293, 2nd column).

With regard to claim 8, Trampert discloses that the propagator is calculated for the recorded seismic wavefield (Page 293-295).

With regard to claim 9, Trampert does not disclose that the propagator used is a coupled P-SV propagator. Silawongsawat teaches a coupled P-SV propagator (pages 8-9, and 11). Silawongsawat teaches the P-SV problem and P-SV matrix propagator.

With regard to claim 10, Trampert discloses assuming that the recorded seismic wavefield can be written as a superposition of plane waves (Page 293, 1st column, under "Propagator Inversion"). It would have been obvious to modify Trampert, which discloses the receivers capable of receiving and processing seismic waves, including P-SV waves, to include using a P-SV propagator as taught by Silawongsawat in order to determine the seismic wavefield of all of the layers of the layers through which the seismic waves pass. This would include the near-surface layer properties, which Trampert discloses are found by inverting the propagator matrix for P-SH waves, but not P-SV waves. Since Silawongsawat teaches that the P-SV propagator also gives

properties of the layers, it would be obvious that the near-surface layer properties could be determined from the P-SV propagator.

With regard to claim 13, Silawongsawat discloses that the inversion of the P-SV wave propagator for material properties is carried out in the frequency domain (Page 8, 1st paragraph).

With regard to claim 14, Trampert discloses that the inversion for material properties is carried out for the surface wave component of the seismic signal (Page 294, 2nd column).

With regard to claim 16, Trampert discloses a method for retrieving local near-surface material information (Summary, page 293). Trampert discloses obtaining seismic wavefield information from a group of receivers comprising at least one buried receiver and at least one surface receiver (Summary, page 296, 2nd Column; Figs. 1-2). Trampert discloses estimating a propagator from the recorded seismic wavefield. Trampert discloses inverting the propagator and retrieving the near-surface material information (Pages 293-295).

Allowable Subject Matter

Claim 12 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

With regard to claim 12, the closest prior art that disclosed propagator matrices for use with seismic waves did not disclose that the propagator is obtained by calculating the inverse Fourier transform of the coefficients disclosed by the applicant.

Conclusion

The cited prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A. Hughes whose telephone number is 571-272-6983. The examiner can normally be reached on M-F 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SAH

JACK KEITH
SUPERVISORY PATENT EXAMINER